



The versatility of Japanese soy sauces is helping to expand the global soy sauce market. Image Source: Unsplash user Kuba Boski

“My mother always kept a gallon of Kikkoman Soy Sauce in the kitchen cubby,” writes Jenny Lee-Adrian. Whether preparing marinades, dipping sauces, or fried rice, the Kikkoman was an ever-present part of cooking in Lee-Adrian’s household. It wasn’t until years later, when she began cooking for herself that she realized there was a world of Japanese soy sauces out there beyond her mother’s beloved Kikkoman and these sauces can “vary wildly in flavor, texture, and appearance.”<sup>1</sup>

Indeed, as Florence Fabricant wrote over 20 years ago, “Soy sauce has many personalities. Its saltiness can vary from breathtakingly intense to mellow and muted. Its consistency ranges from watery to viscous.”<sup>2</sup> This diversity makes Japanese soy sauces ideally suited for a broad variety of uses, whether you’re looking for a dark saishikomi or a light usukuchi. The varied usability of soy sauces combined with an increased propensity of consumers to eat at home and a growing body of research confirming the health benefits of soy help to explain why the soy sauce market is forecasted to increase significantly in the coming years.<sup>3</sup>

As the soy sauce market expands and consumers become more informed about soy sauce options, manufacturers must remain vigilant in [monitoring the quality of their products](#) to ensure they meet both industry and customer standards. As such, integrating spectrophotometric color measurement is an increasingly vital part of soy sauce production, even for those companies using time-honored, traditional methods of manufacturing.



The colors of Japanese soy sauces can vary drastically owing to their raw ingredients and processing methods. Image Source: Flickr user Hiroyuki Ishizawa

### The Creation of Soy Sauce Color

Soy sauces come by their color in a variety of ways. Many American manufacturers, for example, eschew traditional manufacturing methods in favor of “mixing soy protein with water, corn syrup, salt, and caramel color.” This produces a harsh and unappealing products that have little in common with fine soy sauces produced by Japanese companies. The highest quality soy sauces, on the other hand, use no artificial colorants. Instead, their trademark hues are entirely the natural result of traditional ingredients and fermentation-based processing methods. According to Kikkoman, one of the most renowned producers of soy sauce in the world:

The superb color unique to soy sauce is the result of the Maillard Reaction, which begins two or three months after brewing starts. In this reaction, glucose and other sugars combine with amino acids to produce a brown pigment called melanoidin. which gives soy sauce its beautiful color.<sup>4</sup>

In other words, soy sauce grows darker as oxidation occurs, which means that manufacturers must carefully monitor processing to reach the desired level of coloration naturally, without resorting to artificial colorants. Although raw ingredient ratios and processing methods vary depending on the type of soy sauce being produced, the Maillard reaction is a primary component of color production in all soy sauce types.

### Soy Sauce Color as an Indication of Quality and Usability

The Maillard reaction, however, doesn't just affect color; it also has a significant impact on taste and aroma. As such, color in high-quality soy sauces isn't simply a matter of aesthetics, but also acts as an important indicator of overall quality and usability. In fact, color is so important that it is perhaps the most important criteria used by the Japanese Soy Sauce Association to determine soy sauce grade.

Soy sauce grade and color have a [deep impact on consumer perception](#), saleability, and product use. While koikuchi, a darkly colored sauce, is by far the most popular soy sauce in Japan, the lighter-colored usukuchi sauce is preferred by many in the Kyoto region. As Makiko Itoh points out, "In traditional Kyo-ryori (Kyoto cuisine), which has its origins in refined imperial court cooking, dark colored koikuchi soy sauce is considered déclassé and ruins the flavor and appearance of food."<sup>5</sup> Manufacturers must adjust their processing methods to achieve the precise kind and quality of soy sauce they are seeking, whether they are looking to produce tamari, which gives dishes a "burnished reddish-brown color and shine" or shiro, which adds flavor but not color.



Spectrophotometers allow for the highest level of soy sauce color measurement to ensure products meet industry and consumer standards. Image Source: Flickr user McPig

#### Measuring the Color of Soy Sauce

The critical role soy sauce color plays in grading, appeal, and usability means that manufacturers must employ strict color measurement protocols to ensure that the products they produce are correctly processed for their particular purpose. While instrumental color measurement is valuable for the manufacture of all types of soy sauce, it can be particularly vital in the production of light and extra light sauces, which must be produced in "extremely controlled" conditions to ensure "color is not deepened."<sup>6</sup>

Spectrophotometers offer an ideal solution for color measurement challenges by [distilling color information to objective data](#) via sophisticated spectral analysis. These instruments also allow for precise, in-house color grading of soy sauces to ensure that each batch conforms to both industry color standards and [your own color tolerances](#). By monitoring color behavior at every part of production, spectrophotometers can easily confirm that the product is progressing as expected regardless of raw ingredients or processing method used. If out-of-spec color variation occurs,

spectral data may be used to identify production problems and locate the source of the issue. As such, manufacturers are able to rapidly isolate production faults and take appropriate action to correct processing.

#### HunterLab Quality

HunterLab has been a leader in color measurement technology for over 60 years. Today, we offer a comprehensive line-up of portable, benchtop, and in-line spectrophotometers designed for the unique needs of [the food industry](#). We also provide specialized accessories, such as [small path length cells](#) to facilitate accurate measurement of very dark chromatic samples like soy sauce, which may be unsuitable for larger path lengths. [Contact us](#) to learn more about our renowned products and world-class customer service and let us help you select the right tools for your color measurement needs.

1. "Do You Know Your Soy Sauces?", <http://www.seriousseats.com/2011/03/do-you-know-your-soy-sauces-japanese-chinese-indonesian-differences.html>
2. "Taking the Measure of Soy Sauces, to Compare the Tastes," February 16, 1994, <http://www.nytimes.com/1994/02/16/garden/taking-the-measure-of-soy-sauces-to-compare-the-tastes.html>
3. "Global Soy Sauce Market: Trends & Opportunities (2015-2019), September 24, 2015, <http://www.prnewswire.com/news-releases/global-soy-sauce-market-trends-opportunities-2015-2019-300148925.html>
4. "Features of Kikkoman Soy Sauce", <http://www.kikkoman.eu/consumer/kikkoman-quality/quality-of-soy-sauce/features-of-kikkoman-soy-sauce/>
5. "Basics: Japanese Soy Sauce: All You Need to Know (And Then Some)", August 2012, <http://justhungry.com/handbook/just-hungry-handbooks/basics-japanese-soy-sauce-all-you-need-know>
6. "The Draft of the Revised Quality Labelling Standard of Soy Sauce (Shoyu), [http://www.inmetro.gov.br/barreirastecnicas/pontofocal/..%5Cpontofocal%5Ctextos%5Cregulamentos%5CJPN\\_106.doc](http://www.inmetro.gov.br/barreirastecnicas/pontofocal/..%5Cpontofocal%5Ctextos%5Cregulamentos%5CJPN_106.doc)